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**From:** [Nonresponsive based on revised scope]@tetrattech.com]  
**Sent:** 3/27/2018 12:07:15 PM  
**To:** Sklaney, Christopher [sklaney.christopher@epa.gov]  
**Subject:** FW: Review of Keystone Landfill leachate sampling report

Chris-

[Redacted] comments on the leachate report are included below.

Thanks  
Andy

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**From:** [Nonresponsive based on revised scope]  
**Sent:** Monday, March 26, 2018 1:16 PM  
**To:** [Redacted]@tetrattech.com>  
**Cc:** [Redacted]@tetrattech.com>  
**Subject:** Review of Keystone Landfill leachate sampling report

Andy: I have completed my review of the Keystone Landfill "Additional Leachate Monitoring Points Split Sampling Analytical Results" report by Environmental Standards, dated March 12, 2018. Environmental Standards accompanied Golder personnel for a sampling event and obtained split samples where available.

Paired leachate monitoring points and groundwater piezometers were installed at four locations within the landfill. For the subject January 2018 sampling event, groundwater was available in all four piezometers, and leachate was available at two of the locations.

The laboratory analyses of the leachate samples [LMP-3(M) and LMP-5(M)] indicate that the suite of VOCs and the SVOC (1,4-Dioxane) that are leaching into the water within the southern portion of the landfill are very similar to the contaminants detected in the associated piezometers and in the monitoring and extraction wells located along the perimeter of the landfill. The groundwater detected within the landfill at piezometer location LMP-6(P) is very similar in both contaminant composition and concentrations to the groundwater withdrawn at the immediately-downgradient extraction wells EW-6 and K-3. These observations strongly support the interpretation that the landfill continues to act as a source of contamination to the underlying groundwater.

Well construction diagrams and leachate/groundwater elevations were not available in the report. It would be informative to compare the elevations of the leachate and the groundwater in the well pairs to evaluate the potential hydraulic interconnectedness of the leachate and groundwater. I believe it is still unknown whether the observable leachate remains permanently perched above the water table, or slowly infiltrates into the underlying saturated zone. It is also unknown whether the leachate is only produced at the locations where it is detected, or if it is being produced everywhere throughout the landfill, but mostly migrating directly into the groundwater and only collecting at locations where certain required conditions are met (for example, possibly a combination of the screen elevation and the vertical permeability at the base of the waste). In either case, if there is a pathway for the leachate to migrate into the groundwater (and the data suggest that this pathway exists), then the landfill will continue to generate contaminated groundwater that must be captured at the site perimeter.

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